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A NEW PEARLFISH (FAMILY CARAPIDAE) FROM
THE GULF OF CALIFORNIA¹

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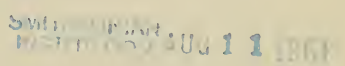
Recent investigations of the shelf fauna of the Gulf of California, México, have revealed a number of novelties, among which is an undescribed species of pearlfish. Reference to the review by Arnold (1957) leaves little doubt that this new form is referable to the genus *Echiodon* Thompson 1837. This is somewhat surprising since one of the two species placed with certainty in *Echiodon* occurs in the North Atlantic, and the other in the Mediterranean. However, the Pacific specimen shares certain distinctive characters with *Echiodon drummondii* Thompson 1837 and *E. dentatum* (Cuvier, 1817): There is a diastema in the lower jaw, the teeth are arranged in bands, the transverse processes of the third, fourth, and fifth vertebrae are unfused, and the anus is posterior (for a carapid). These features indicate that the present specimen cannot be placed either in *Carapus*, in which the tooth rows of the jaws are continuous, the lateral processes of the third and fourth vertebrae are fused, and the anus is under the pectoral base, or in *Encheliophis*, in which the teeth in the lower jaw are in a single continuous row, the lateral processes of the third, fourth, and fifth vertebrae are fused, and the anus is anterior in position.

***Echiodon exsilium*, new species**

Fig. 1

Holotype: Fish Collection, Scripps Institution of Oceanography, University of California, La Jolla, S.I.O. 60-97-61A, a 100 mm ♀ taken

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by Robert H. Parker on the R. V. "Spencer F. Baird" in 35–41 fathoms on a muddy sand bottom off Estero de Tasiota (from 28° 13.8' N, 111° 46.7' W to 28° 15' N, 111° 48' W), Golfo de California, Sonora, México, on 21 March 1960. The type was taken in a shrimp trawl and the host is unknown. The specimen may have been free-living, since the collection contained no holothurians, no large lamellibranchs or echinoids, and only two gastropods of moderate size.

Following are counts and measurements in millimeters of the type and single known specimen: Precaudal vertebrae 22; gill rakers 0 + 1 + 2 (+ six rudiments); branchiostegals 7; pectorals 20; dorsal and anal undeterminable. Total length 100.0; snout to dorsal origin 20.9; snout to anal origin 17.1; snout to center of anus 17.0; body depth at anus 7.9; head length 14.1; head depth 6.0; head width 5.9; snout 3.1; bony orbit diameter 3.2; eye diameter 2.9; interorbit 2.0; upper jaw 7.2; pectoral 8+ (tips of middle rays curled).

The body is elongate and tapering; the maximum depth is at the anus and is contained 13 times in the total length. The head is about one-seventh of the total length. The upper profile of the head is slightly convex from the nape to before a point above the middle of the eye, then shallowly concave to a point even with the posterior nostril. Anterior to the posterior nostril the profile descends abruptly to the upper lip. The short, obtuse snout is 5 in the head. Both nostrils are circular, but the anterior ends in a short tube. The nasal capsule is large, half as long as the orbit. The olfactory rosette has five pairs of simple, flattened lamellae. The bony orbit goes 8 times in the snout and 4.8 times in the head. The narrow interorbital is contained 1.7 times in the orbit.

The maxillary extends behind the orbit for a distance somewhat less than one-half an orbit diameter. The lower jaw is slightly shorter than the upper, which overhangs it by a distance about equal to the diameter of the pupil. A fang at the front of each upper jaw is separated by a pronounced diastema from a band of villiform teeth, which is about five rows wide anteriorly and two rows wide posteriorly. The dentition of the lower jaw is similar, except that the diastema is more pronounced, and the bone narrows at this point (see Arnold, 1957: 256, Fig. 3B). The vomer is covered by an oval patch of blunt, almost granular, teeth. The villiform palatine teeth are in a band about four rows wide. The vomerine and palatine tooth patches are well separated. There are two crescentic patches of tiny upper pharyngeal teeth on each side. The toothless tongue ends in a narrow free forward projection.

The anus is posterior for a carapid: 2.8 mm behind a vertical through the middle of the pectoral base. The body cavity extends far back of the anus. It ends 18.4 mm behind the center of the anus, and is empty of any organs for the last 11.8 mm. In *Carapus* a similar cavity is filled by the gas-bladder. In *E. exsilium*, however, the gas-bladder is elongate and tightly applied to the roof of the body cavity. In this respect it resembles the gas-bladder of *E. dentatum* as figured by Emery (1880: Pl. II, Fig. 15).

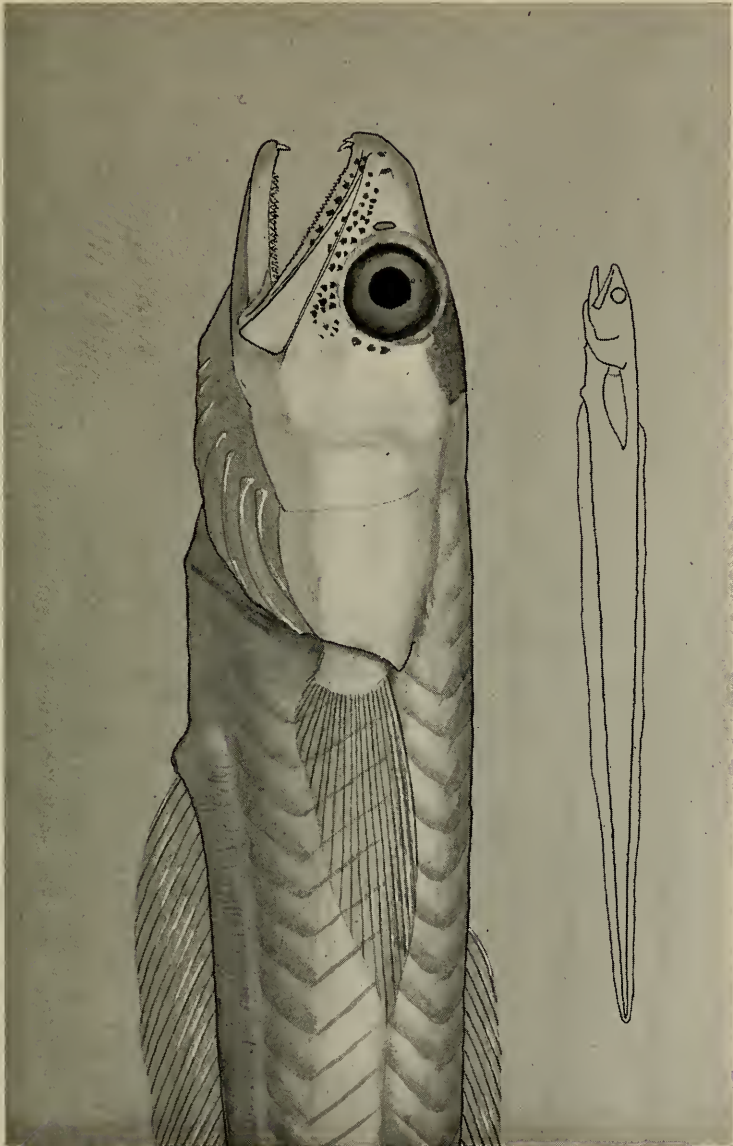


FIG. 1. *Echiodon exsilium* new species. Female holotype, SIO-60-97-61A. Total length, 100 mm.

There is a narrow slit behind the fourth gill arch. There appear to be no pseudobranchiae. The gill rakers are poorly developed. There are none on the upper limb of the first arch, and only the one at the angle and the two immediately below it are well developed. They are about half as long as the eye; the remaining six are developed as low rudiments only. The rakers of the posterior arches are all rudimentary.

I am unable to determine the position of the pores along the sensory canals of the head, nor can I observe any lateral line pores.

The origin of the dorsal is over the posterior third of the pectoral, and above a vertical from the tenth or eleventh anal ray. The dorsal and anal are confluent with the very reduced caudal. The pectoral is long and almost filamentous at the posterior extremity.

The body is mostly pale. The skull is dark brown around the brain case, and some dark pigment runs down either side of the snout and continues back beneath the eye as a feeble bar. The anterior half of the body is completely colorless, but about halfway back there begins a series of dots along the bases of the vertical fins. There is a dusting of black pigment over the posterior third of the body, concentrated mostly along the fin bases and the edges of the myomeres. The peritoneum is mostly white, although there are a few melanophores ventrally, and a larger number dorsally.

The name is derived from the Latin *exsilium*, an exile, and refers to the geographic isolation of the species from other members of the genus.

Echiodon exsilium is not closely related to the carapids reported in the eastern Pacific, *Carapus dubius* (Putnam 1874), *Encheliophis jordani* Heller and Snodgrass, 1903, and *E. hancocki* (Reid, 1940). The characters which separate the genus *Echiodon* from the species of the above genera are discussed in the introduction.

Arnold placed two species in *Echiodon*, *E. drummondi* Thompson, 1837, and *E. dentatum* (Cuvier, 1817). On the basis of dentition, *E. exsilium* is closer to *dentatum* than to *drummondi*. As in *dentatum* the vomerine tooth patch is rounded posteriorly, and there is a distinct gap between the vomerine and palatine dentition. *E. exsilium* also agrees with *dentatum* in the relatively anterior insertion of the dorsal fin (see Arnold's Figs. 16 and 17). *E. dentatum* and *exsilium* differ markedly in head shape, however. In *E. dentatum* the major outline of the head is concave from the occiput to the snout, whereas in *E. exsilium* the major outline of the upper surface of the head is convex (there is a shallow concavity, just before the eyes). Also, the head is wider (width 42% of head length rather than 32%) and the pectoral fin longer (56% of head length rather than 42%) in *exsilium* than in *dentatum*. In addition there appears to be a difference in the number of precaudal vertebrae. According to Emery (1880: 26), *E. dentatum* has 95 vertebrae of which 26 are precaudal. Radiographs of the type of *E. exsilium*, however, indicate that only the first 22 vertebrae bear unfused haemal arches. In the 23rd vertebra the haemal arches are fused to form a haemal spine. This is not an apparent effect produced by the hiding of one haemal

element by another in the picture, since three radiographs, each taken from a different angle, show only 22 precaudal vertebrae. Due to the attenuation of the body, the total number of vertebrae cannot be determined.

Arnold felt that two more species might prove to be referable to *Echiodon*. These are *Carapus rendahli* Whitley, 1940, and *C. cinereus* Smith, 1955. The sketchy description of *C. rendahli* indicates that in that species the pectoral fin is considerably shorter (4 in the head rather than 1.8) and the dorsal origin farther forward (predorsal about .9 in head rather than .66). *Carapus cinereus* differs from *E. exsilium* in a number of respects. The most important difference involves the vomerine dentition. In *C. cinereus* (as in a number of species of *Carapus*) the vomer bears a median row of enlarged teeth, while in *E. exsilium* none of the vomerine teeth is enlarged. Also in *C. cinereus* the dorsal and anal origins are farther forward (predorsal 15% of total length rather than 21%) and the head is somewhat shorter (10.8% of length rather than 14.1%). It is not likely that the observed difference in head length is due to the greater size of the type of *C. cinereus* (215 mm), since the observed tendency in the Carapidae is for the head to become proportionally larger with increasing size (Arnold, 1957).

The zoogeographic implications of the discovery of a species of *Echiodon* in the eastern tropical Pacific are difficult to assess. It is unfortunate that the generic affinities of the Indian Ocean and Pacific species *Carapus cinereus* and *C. rendahli* cannot be determined with certainty, although it seems probable that *rendahli* at least will prove to be referable to *Echiodon*. The available evidence suggests that the affinities of *E. exsilium* lie with the Atlantic species, especially *E. dentatum*. This would suggest that *E. exsilium* or a progenitor entered the eastern Pacific from the east, via a Tertiary Central American water gap (Durham and Allison, 1960: 66-68, Fig. 7), rather than from the west, across the eastern Pacific barrier (Ekman, 1953: 72-75). If this hypothesis is correct, it might reasonably be expected that the western Atlantic might harbor a species of *Echiodon*. That no such form has yet been captured is not surprising considering the rarity of carapids in collections.

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